4. $f(x) = \frac{4x+5}{9-3x}$

a. $\lim_{x \to -1} f(x) = \lim_{x \to -1} \frac{4x+5}{9-3x} = \frac{1}{12}$ ∴ conti...

c. ~~b.~~ $\lim_{x \to 3} f(x) \lim_{x \to 3} \frac{4x+5}{9-3x} = \frac{17}{0}$ not defi...

b. $\lim_{x \to 0} f(x) = \lim_{x \to 0} \frac{4x+5}{9-3x} = \frac{5}{9}$ continu...

5. $\lim_{x \to \infty} \frac{6e^{4x} - e^{-2x}}{8e^{4x} - e^{2x} + 3e^{-x}}$

$\lim_{x \to \infty} \left(\frac{6e^{4x} - e^{-2x}}{e^{4x}} \right) \left(\frac{e^{4x}}{8e^{4x} - e^{2x} + 3e^{-x}} \right)$

$\lim_{x \to \infty} \frac{(6 - 6e^{-6x})}{8 - e^{-2x} + 3e^{-5x}} = \frac{6}{8} = \frac{3}{4}$

6. $\lim_{y \to 6} g(y) = \lim_{y \to 6} (1 - 3y) = -17$

L.H.L

$\lim g(y) = \lim_{y \to 2^-} (y^2 + 5)$

$= 9$

R.H.L

$\lim g(y) = \lim_{y \to 2^+} (1 - 3y)$

$= 7$

f x
7
$2f_2$ 49
60
f_3
90 99
60
35
400
$+2f_4 = 148$

$4f_4$

Calculus Assignment 1

1. $\lim_{h\to 0} \frac{2(-3+h)^2 - 18}{h}$

$\lim_{h\to 0} \frac{18 - 12h + 2h^2 - 18}{h}$

$\lim_{h\to 0} = \frac{h(2h-12)}{h} = 2h - 12 = -12$

2. $g(x) = \begin{cases} 2x & x < 6 \\ x-1 & x \geq 1 \end{cases}$

L.H.L $\lim_{x\to 4^-} g(x)$ R.H.L $\lim_{x\to 4^+} g(x)$

$\lim_{x\to 4^-}(2x) = 8$ $= \lim_{x\to 4^+}(2x) = 8$

$\therefore$ function is continious at $x = 4$

b. L.H.L $\lim_{x\to 6^-} g(x)$ $\lim_{x\to 6^+} g(x)$

$= \lim_{x\to 6^-}(2x) = 12$ $= \lim (x-1) = 5$

$\therefore$ Function is not continoious

3. $\lim_{x\to 9} \frac{x-9}{3-\sqrt{x}} \Rightarrow \lim_{x\to 9} = \frac{(\sqrt{x})^2 - 3^2}{(3-\sqrt{x})}$

$= \lim \frac{(\sqrt{x}-3)(\sqrt{x}+3)}{(\sqrt{x}-3)}$

$= \frac{-\sqrt{9}+3}{}$

$= -6$

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6. $Q(u) = \dfrac{2}{(6+(2u)-u^2)^4} = y$

$(2-2u)$

$\dfrac{dy}{du} = \dfrac{2}{(6+2u-u^2)^5}$

$= \dfrac{-16(1-u)}{(6+2u-u^2)^5}$

$\dfrac{d^2y}{du^2} = -16\left[\dfrac{(6+2u-u^2)^5(-1)(6+2u-u^2)^4 \; 2-2u)}{(6+2u-u^2)^{16}}\right]$

$= -16\left[\dfrac{(u^2-2u-6)-2(1-u)^2}{(6+2u-u^2)^6}\right]$

$= \dfrac{(2(1-u)^2-(u^2)+2u-6)16}{(6+2u-u^2)^6}$

c $f(t) = \ln(1+t^2)$

$f'(t) = \dfrac{1}{1+t^2}(2t$

$f''(t) = \dfrac{(1+t^2)(2)-2(t)(2t)}{(1+t^2)^2}$

$= \dfrac{2+2t^2-4t^2}{(1+t^2)^2} = \dfrac{2-2t^2}{(1+t^2)^2}$

13. $f(x)\; y = x^3 - 3x^2 - 9x + 12$

$f'(x) = 3x^2 - 6x - 9$

$f''(x) = 6x - 6$

$f''(-1) = -6-6$

$= -12$

$f''(3) = 18-6$

$f''(3)$

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8. $R(\omega) = \frac{3\omega + \omega^4}{2\omega^2 + 1}$

$\frac{d(R(\omega))}{d(\omega)} = \frac{(2\omega^2+1)(3+3\omega^3) - (3\omega + \omega^4)(4\omega}{(2\omega^2+1)^2}$

9. $f(x) = 2e^{2x} - 8^x$

$f'(x) = 2e^{2x} - 8^x \log_e 8$

10. $y = z^5 - e^2 \ln(z)$

$\frac{dy}{dz} = 5z - \left(e^2 \frac{1}{z} + e^2 \ln(z)\right)$

$= 5z^4 - \frac{e^2}{z} + - e^2 \ln(z)$

11.

11.

a. $f(x) = (6x^2 + 7x)^4$

$= 4(6x^2 + 7x)^3 (12x + 7)$

b. $f(t) = 5 + e^{4t + t^7}$

$f'(t) = e^{4t + t^7} (4 + 7t^6)$

12.

a. $z = \ln(7 - x^3)$

$\frac{dz}{dx} = \frac{1}{7 - x^3} (3x^2)$

$\frac{d^2 z}{dx^2} = -\left[\frac{(7-x^3)(6x) - (3x^2)(-3x^2)}{(7-x^3)^2}\right.$

b.

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14. $f(x) = 4x^3 - 18x^2 + 24x - 7$

$f'(x) = 12x^2 - 36x + 24 = x^3 - 3$

$f''(x) = 24x - 36$

$\cancel{f''(2)}$

$f''(2) = 48 - 36$ $f''(1) = 24 - 36$

$= -12$

$f(1) = 4 - 18 + 24 - 7$ $f(2) = 32 - \ldots + 48 - 7$

15. $f(x) = x^2(x+3) = x^3 + 3x^2$

$f'(x) = 3x^2 + 6x = 0$

$x^2 + 2x = 0$

$x(x+2)$

$f(0) = 0$

$f(-2) = -8 + 12 = 4$

$f'(-1) = 9$

$f(-3) = 9$